FACTORS CONTROLLING DRAINED WEIGHT IN CANNED PRAWN

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The paper gives an account of factors controlling the drained weight in canned prawn. The most important among them are concentration of brine used for blanching and blanching time which are found to be fixed and specific for different sizes of prawn irrespective of the quality of the material used. Other factors such as, acidity of brine used for filling the can, volume of brine, time of sterilization and time of cooling the blanched meat are also to some extent found responsible for fluctuations in drained weight.

INTRODUCTION

In order to avoid short weight conditions, canners in general, add extra amount of meat on an arbitrary basis in each can often resulting in excess weight upto even twenty grams over the declared drained weights. Existing regulations both in India and the importing countries do not put any limit to weights over the declared minimum and as such the exporters do not face the risk of detention. However, overfilling causes other major difficulties from both technical and economic angles. India is exporting about 2,000 metric tons of canned prawn annually which involves about 1,50,00,000 cans. If on an average ten grams of extra amount of meat is taken into consideration per can the total amount works out to about 150 tons which corresponds to nearly 300 tons of peeled prawn. This amount may be regarded as a waste so far as foreign exchange is concerned. Thus the problem of controlling the drained weight in canned prawn products is of paramount importance to the trade and to the country. No work has so far been done in this field in any of the prawn consuming countries of the world although attempts have been made to explain the causes of thaw drip losses (Pawar & Magar 1966) and its prevention (Mac Callum *et al*,1964) occurring in frozen fishery products.

The present work was undertaken to find out the probable factors responsible for fluctuations in drained weight of the processed cans and to suggest methods for rectifying the same in order that uniformity in the quality could be achieved.

MATERIALS AND METHODS

M. dobsoni, the most important species of prawn, from the point of view of canning in India, was used throughout the experiment. Fresh raw material of uniform size was obtained from a local source. Dressed and cleaned meat was blanched in 7% brine containing 0.2% citric acid for four minutes i. e. two minutes after reboiling. 128 g of blanched meat was packed in 301 x 206 cans with 90 cc of 3% brine containing 0.1% citric acid. Sterilization was carried out for 18 minutes at 115.2°C. For studying the effects of various concentrations of acid and salt both in filling and blanching brine, volume of brine in the pack and times of sterilization, blanching and cooling, the following modifications were effected in the standard process mentioned above.

i Filled the can with 3% brine containing 0.1%, 0.3%, 0.5% & 1.0% citric acid.

ii Filled the cans with 3.0%, 5.0%, 7.0%, 10.0% brine.

iii Blanched the meat in 7% brine containing 0%, 0.1%, 0.25%, 0.50% and 1.0% citric acid.

iv Blanched for four minutes in 0%, 5%, 7%, 10% & 12% brine.

v Packed with 0ml, 20ml, 40ml, 60ml, 80 ml and 100 ml of 3% brine.

vi Sterilized for 10, 20, 30, 40 minutes at 115°C

vii Blanched for 3, 4, 5, 6, 8 and 10 minutes in 7% brine.

viii Blanched meat was subjected to air drying for 10, 30, 60, 90, 120 & 180 minutes.

All estimations were carried out according to the A. O. A. C. (1955) methods.

RESULTS AND DISCUSSION

1. *Blanching*

a) Time of blanching.

Blanching is one of the most important steps in canning. It is clear from Table I that in order to get a correct drained weight blanching should be carried out in such a way that the moisture level of the blanched meat be identical with equilibrium moisture (EM) content of the tissue, which depends on species and size of prawn but is independent of processing time, raw material quality and time of blanching (Chaudhuri & Balachandran, 1965). If the moisture content of the blanched meat is lower or higher than E. M. level there is either an increase or a decrease in drained weight under identical conditions of packing and processing. The increase in drained weight is due to the fact that the blanched meat having lower moisture level than E. M. absorbs

TABLE I INFLUENCE OF BLANCHING TIME ON DIFFERENT SIZE GRADES OF PRAWNS

Size grade	Coc. of brine %	Total blanching time in minutes	Moisture content of Blanched meat	Moisture content of Canned meat	Drained Wt. in gm.	Volume of drained brine in ml.
Tiny	7	1	77.84	72.45	118	100
,,	,,	2	76.52	72 42	120	97
,,	,,	3	74.66	72.41	124	94
,,	,,	4	72.51	72.45	128	90
,,	,,	6	70.58	72 48	131	87
,,	,,	8	68.25	72.43	133	85
Small	5	5	72.40	72.42	128	90
Medium	,,	6	72.45	72.45	128	90
Large	,,	7	72.42	72.44	128	90

water from the filled brine to attain the fixed E. M. level of the tissue. On the other hand blanched meat having more moisture than E. M. gives up some moisture after processing to come down to the fixed E. M. level. With corresponding increase or decrease in drained weight there is also a corresponding reduction or gain in drained volume of the filled brine respectively i. e. the increase in the drained weight of the meat will be compensated by the reduction in the weight of the filled brine and vice versa. About 3.0 g of prawn meat is soluble in the filled brine under standard processing condition but this solubility does not affect the drained weight as it is compensated by the amount of water adhering to the surface of the meat.

As the time of blanching increases (Table I) There is a continuous reduction in the moisture level of prawn tissue until the shrinkage is constant. After four minutes the moisture level of tiny prawn meat comes down to E. M. level and the corresponding weight of the packed meat is retained even after retorting. It is seen that time of blanching varies with the size of prawn to attain desired E. M. level. For tiny size of prawn the total blanching time is 4 minutes, for small it is 5 minutes, for medium it is 6 minutes and for large it is 7 minutes and so on.

b) Concentration of blanching brine.

With the increase in concentration of brine used for blanching there is a continuous reduction in the moisture level of meat with a simultaneous uptake of salt by the tissue under normal blanching conditions and depending upon the difference in the level of E. M. and moisture content of blanched meat there will be an increase in drained weight as indicated in Table II.

2. *Concentrations of acid in blanching and filling brines*

Effect of quantity of acid added in blanching and filling brines is shown in Tables III & IV. It is seen from Table III that with increase in concentration of acid in blanching brine there is a gradual increase in the solubility of tissue but this acidity does not influence the final drained weight of the can as the normal solubility of the tissue is not affected by standard method of processing. On the other hand with more acid in the filling brine there is a gradual reduction in drained weight (Table IV) due to higher degree of solubility of the tissue. Moreover, E. M. level of the tissue is found to be affected at and above 0.7% acid level.

3. *Volume of brine used for filling.*

Effects of concentration and volume of brine used for filling the cans are

TABLE II EFFECT OF CONCENTRATION OF BRINE KEEPING THE TIME OF BLANCHING CONSTANT

Conc. of brine used for blanching %	Moisture content of blanched meat %	Protien loss during blanching g. dry/250 g. fresh prawn	Salt absorbed after blanching g. dry/250 g fresh prawn	Drained weight of canned meat g.	Vol. of drained brine in ml.	Protein leached out in filled brine g (dry)/ 128 g canned meat
0	72.48	1.15	—	128	90	0.89
5	72.58	1.18	2.85	-do-	-do-	0.85
7	72.59	1.19	5.75	-do-	-do-	0.83
10	71.05	1.22	9.42	130	88	0.84
12	69.92	1.25	10.15	131	87	0.82

shown in Tables V & VI. Changes in the concentrations of filled brine do not influence the drained weight of the can but there is a corresponding increase in salt content and solubility of the tissue which are maximum at 7.0% level and above that both the levels remain more or less same. Volume of brine to some extent helps in

TABLE III EFFECT OF CONCENTRATION OF ACID IN BLANCHING BRINE

Level of acid in 7% blanching brine. %	Protein loss in blanching brine g. dry/100 g. fresh meat.	Drained Wt. of oanned meat g.	Volume of drained brine ml.	Protien leached out in filledbrine g. (dry) / 128 gm canned meat.
0	1.08	128	90	0.79
0.10	1.68	-do-	-do-	0.99
0.25	1.75	-do-	-do-	0.80
0.50	1.87	-do-	-do-	0.80
1.00	2.11	-do-	-do-	0.79

TABLE IV EFFECT OF CONCENTRATION OF ACID IN FILLED BRINE

Level of acid added in filling brine %	*Moisture content %* Blanched meat	Canned meat	Drained wt. of canned meat g.	Volume of drained brine ml.	Protein loss in filled brine g. (dry)/ 128 g. canned meat
0.1	72.45	72.43	128	90	0.79
0.3	72.44	72.45	124	94	1.89
0.5	72.45	72 44	122	96	2.49
0 7	72.46	71.90	119	100	2.84
1.0	72.45	71.48	102	102	3.41

TABLE V EFFECT OF VOLUME OF BRINE USED FOR FILLING

Volume of 3% brine used for filling ml.	Moisture content of canned meat%	Drained wt. of canned meat g.	Volume of drained brine ml.	Protien leached out in filled brine g. (dry)/ 128 g. canned meat
0	71.08	124	4	0.18
20	71.50	-do-	22	0.28
40	71.88	126	42	0.66
60	72.10	-do-	62	0.74
80	72.44	128	80	0.81
100	72.45	-do-	100	0.80

TABLE VI EFFECT OF CONCENTRATION OF BRINE USED FOR FILLING

Conc. of brine used for filling %	Drained wt. of canned meat g.	Volume of drained brine ml.	Protein loss in filled brine g. (dry)/ 128 g. canned meat	Salt absorbed by the tissue g/ 128 g. canned meat
0	128	90	0.79	0.95
3 0	-do-	-do-	0.80	2.05
5.0	-do-	-do-	0.81	3 28
7.0	-do-	-do-	0.86	3.54
10.0	-do-	-do-	0.86	3.55

controlling the drained weight of the product. It is seen from Table VI that there is an optimum volume above which the drained weight is not affected but if the quantity of liquid inside the can is not sufficient, E. M. level of the tissue will not be attained. So the volume below the optimum (80 ml) will always influence the drained weight of the can.

4. *Processing and cooling times of blanched meat.*

Processing time and the time used for cooling the blanched meat by air blowing were found to influence the drained weight as indicated in Tables VII & VIII respectively. With increase in time of cooling the moisture content of tissue gradually decreases. As the difference between E. M. and moisture content of blanched meat increases there will also be a gradual increase in drained weight as shown in Table VII. With increasing time of autoclaving there is an increase in the solubility of protein in the filled brine, which in turn affects the drained weight as indicated in Table VIII. Losses in drained weight can be accounted for by a corresponding increase in protein content of the filled brine.

5. *Quality of raw material used for blanching.*

Table IX indicates the influence of material quality on the drained weight. Fresh, iced, frozen and thawed material or spoiled prawn do not in any way affect the drained weight of the can when processed under standard conditions, as E. M. content of prawn tissue is independent of the quality of the material. The initial quality of the material however controls the extent of solubility of protein in blanching brine and only to some extent in filled brine. The relationship is shown in Table IX.

TABLE VII EFFECT OF TIME AT CONSTANT TEMPERATURE (115.2° C) OF STERILISATION

Time of sterilization minutes	Moisture content of blanched meat %	Drained wt. of canned meat g.	Volume of drained brine	Protein loss in filled brine g (dry)/ 128 g. canned meat
10	72.40	128	90	0.79
20	72.45	-do-	-do-	0.81
30	72.43	-do-	-do-	0.91
40	72.44	-do-	-do-	0.98

TABLE VIII EFFECT OF TIME OF COOLING OF BLANCHED MEAT BY AIR BLOWING

Time of cooling minutes	Moisture content of blanched & cooled meat %	Moisture content of canned meat %	Drained wt. of canned meat g.	Volume of drained brine ml.
10	72.48	72.45	128	90
30	72.08	72.44	-do-	-do-
60	71.05	72.48	130	88
90	70.57	72.45	131	87
120	69.77	72.45	132	86
180	67.05	72.46	135	83

TABLE IX EFFECT OF MATERIAL QUALITY WITH PARTICULAR RELATION TO A SIZE (TINY)

Quality of material used	Initial moisture content %	Moisture content after blanching %	Moisture content after canning %	Drained wt. of canned meat g.	Protein loss during blanching g. (dry) / 128 g. fresh prawn	Protein leached outin filled brine, g. (dry)/ 128 gm. canned meat
i) Fresh	83.39	72.48	72.45	128	1.20	0.79
ii) Iced (6 days)	85.69	72.44	72.44	-do-	1.42	0.80
iii) Frozen & thawed	81.25	72.45	-do-	-do-	1.19	0.75
iv) Spoiled	87.50	72.43	72.45	-do-	1.85	0.82

6. *Time of exhausting.*

Exhausting time does not influence the drained weight of the can.

Conclusions

Results of the experiments reveal that in order to get correct drained weight (128 g) blanching should be carried out in 7% boiling brine for four minutes (two minutes for reboiling and two minutes for cooking) for tiny size of fresh prawn in presence of 0.2% citric acid and immediately after cooling 128 gm. of blanched meat should be packed in the can with 90 ml of 3% brine containing 0.1% critic acid. Sterilization is to be carried out at 115.2°C for 18 minutes. Acid level of the filling brine should be in accordance with the quality of the raw material used which will be communicated later.

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